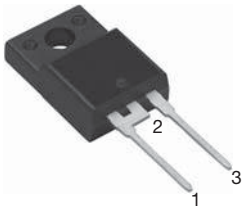
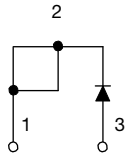
Fast Soft Recovery Rectifier Diode, 20 A



TO-220 FULL-PAK



FEATURES

- 150 °C max. operation junction temperature
- Designed and qualified according to JEDEC®-JESD47
- Fully isolated package (V_{INS} = 2500 V_{RMS})
- UL E78996 approved
- Material categorization: For definitions of compliance please see www.vishay.com/doc?99912

RoHS COMPLIANT
HALOGEN FREE Available

APPLICATIONS

These devices are intended for use in output rectification and freewheeling in inverters, choppers and converters as well as in input rectification where severe restrictions on conducted EMI should be met.

DESCRIPTION

The VS-20ETF0..FP... fast soft recovery rectifier series has been optimized for combined short reverse recovery time and low forward voltage drop.
The glass passivation ensures stable reliable operation in the most severe temperature and power cycling conditions.

PRODUCT SUMMARY	
Package	TO-220FP
$I_{F(AV)}$	20 A
V_R	200 V, 400 V, 600 V
V_F at I_F	1.3 V
I_{FSM}	300 A
t_{rr}	60 ns
T_J max.	150 °C
Diode variation	Single die
Snap factor	0.6

MAJOR RATINGS AND CHARACTERISTICS			
SYMBOL	CHARACTERISTICS	VALUES	UNITS
$I_{F(AV)}$	Sinusoidal waveform	20	A
V_{RRM}		200 to 600	V
I_{FSM}		300	A
V_F	10 A, T_J = 25 °C	1.2	V
t_{rr}	1 A, 100 A/µs	60	ns
T_J		-40 to 150	°C

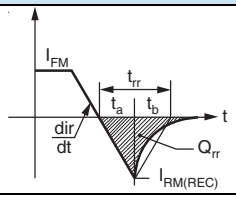
VOLTAGE RATINGS			
PART NUMBER	V_{RRM}, MAXIMUM PEAK REVERSE VOLTAGE V	V_{RSM}, MAXIMUM NON-REPETITIVE PEAK REVERSE VOLTAGE V	I_{RRM} AT 150 °C mA
VS-20ETF02FPPbF, VS-20ETF02FP-M3	200	300	5
VS-20ETF04FPPbF, VS-20ETF04FP-M3	400	500	
VS-20ETF06FPPbF, VS-20ETF06FP-M3	600	700	

ABSOLUTE MAXIMUM RATINGS				
PARAMETER	SYMBOL	TEST CONDITIONS	VALUES	UNITS
Maximum average forward current	$I_{F(AV)}$	T_C = 51 °C, 180° conduction half sine wave	20	A
Maximum peak one cycle non-repetitive surge current	I_{FSM}	10 ms sine pulse, rated V_{RRM} applied	250	
		10 ms sine pulse, no voltage reapplied	300	
Maximum I^2t for fusing	I^2t	10 ms sine pulse, rated V_{RRM} applied	316	A^2s
		10 ms sine pulse, no voltage reapplied	442	
Maximum $I^2\sqrt{t}$ for fusing	$I^2\sqrt{t}$	t = 0.1 ms to 10 ms, no voltage reapplied	4420	$A^2\sqrt{s}$

ELECTRICAL SPECIFICATIONS

PARAMETER	SYMBOL	TEST CONDITIONS		VALUES	UNITS
Maximum forward voltage drop	V_{FM}	20 A, T_J = 25 °C		1.30	V
		60 A, T_J = 25 °C		1.67	
Forward slope resistance	r_t	T_J = 150 °C		12.5	mΩ
Threshold voltage	$V_{F(TO)}$	T_J = 150 °C		0.9	V
Maximum reverse leakage current	I_{RM}	T_J = 25 °C	V_R = Rated V_{RRM}	0.1	mA
		T_J = 150 °C		5.0	

RECOVERY CHARACTERISTICS

PARAMETER	SYMBOL	TEST CONDITIONS	VALUES	UNITS	
Reverse recovery time	t_{rr}	I_F at 20 Apk 100 A/µs 25 °C	160	ns	
Reverse recovery current	I_{rr}		10	A	
Reverse recovery charge	Q_{rr}		1.25	µC	
Snap factor	S	Typical	0.6		

THERMAL - MECHANICAL SPECIFICATIONS

PARAMETER		SYMBOL	TEST CONDITIONS	VALUES	UNITS
Maximum junction and storage temperature range		T_J, T_{Stg}		-40 to 150	°C
Maximum thermal resistance, junction to case		R_{thJC}	DC operation	2.5	°C/W
Maximum thermal resistance, junction to ambient		R_{thJA}		62	
Typical thermal resistance, case to heatsink		R_{thCS}	Mounting surface, smooth and greased	0.5	
Approximate weight				2	g
				0.07	oz.
Mounting torque	minimum			6 (5)	kgf · cm (lbf · in)
	maximum			12 (10)	
Marking device			Case style TO-220 FULL-PAK	20ETF02FP 20ETF04FP 20ETF06FP	

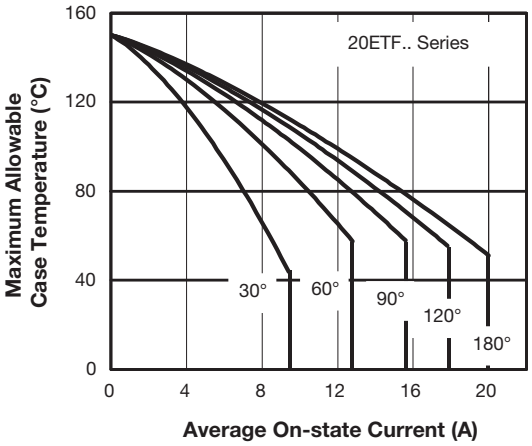


Fig. 1 - Current Rating Characteristics

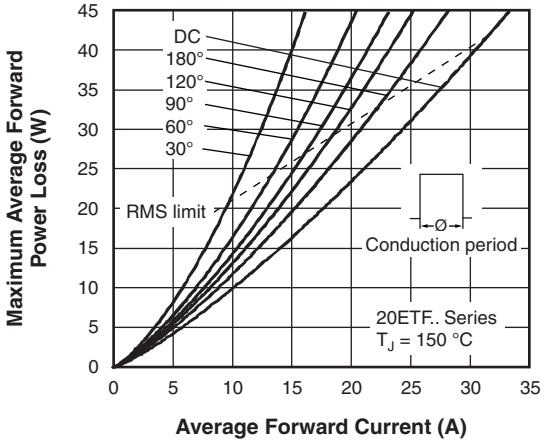


Fig. 4 - Forward Power Loss Characteristics

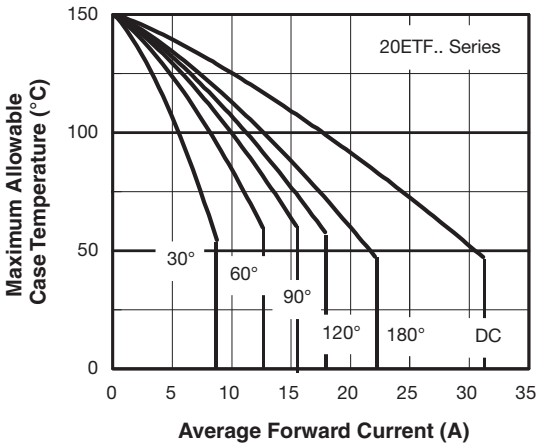


Fig. 2 - Current Rating Characteristics

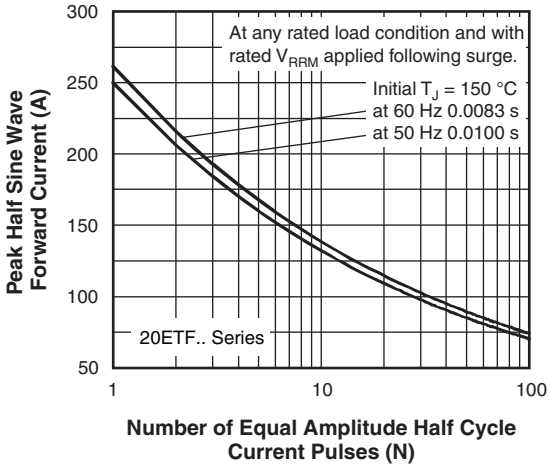


Fig. 5 - Maximum Non-Repetitive Surge Current

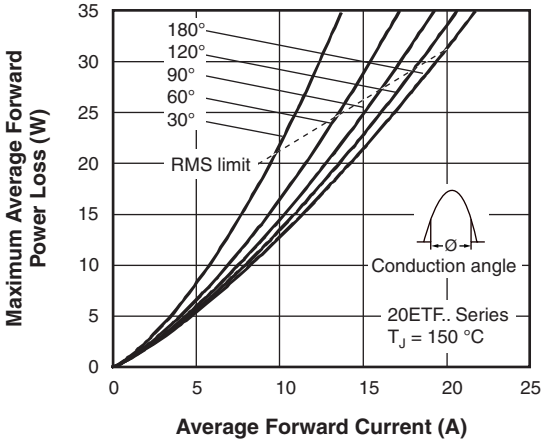


Fig. 3 - Forward Power Loss Characteristics

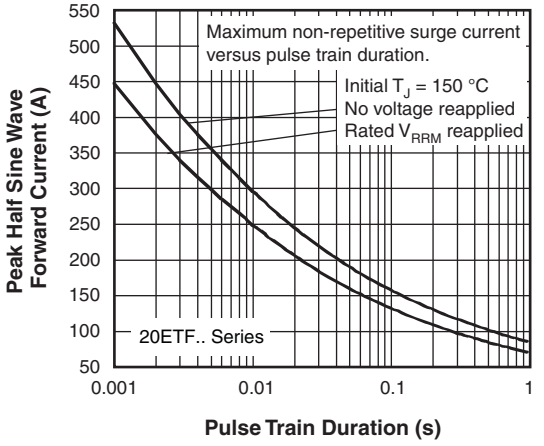


Fig. 6 - Maximum Non-Repetitive Surge Current

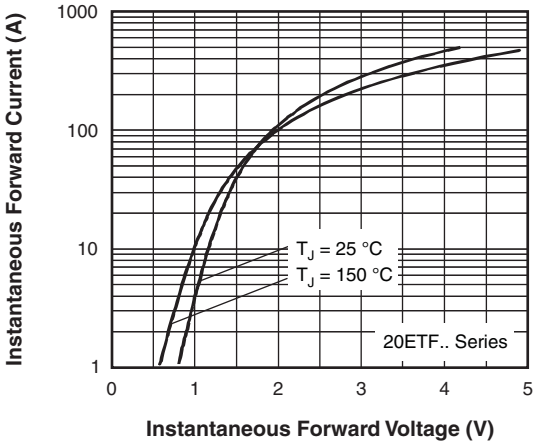


Fig. 7 - Forward Voltage Drop Characteristics

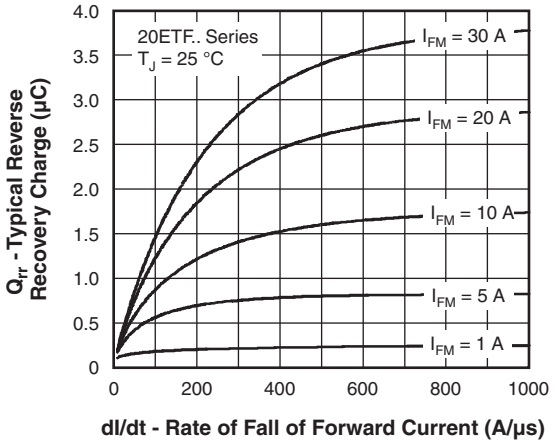


Fig. 10 - Recovery Charge Characteristics, T_J = 25 °C

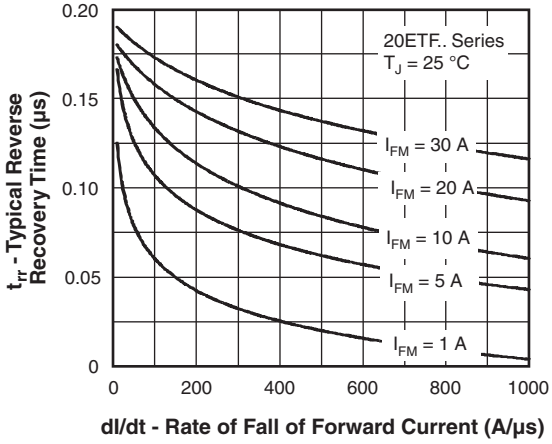


Fig. 8 - Recovery Time Characteristics, T_J = 25 °C

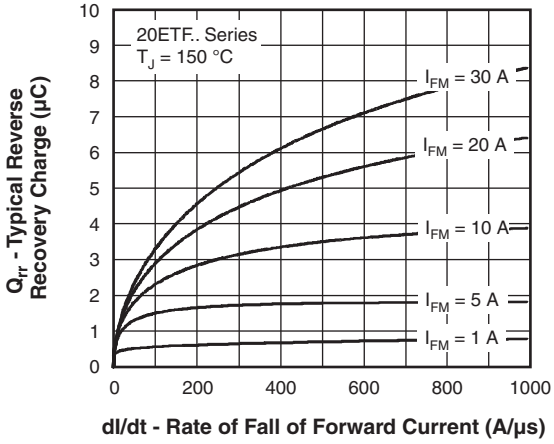


Fig. 11 - Recovery Charge Characteristics, T_J = 150 °C

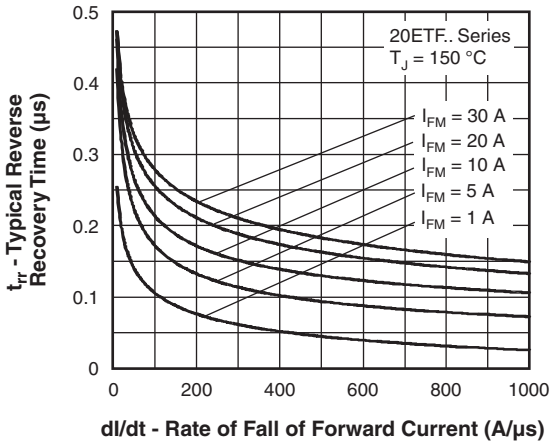


Fig. 9 - Recovery Time Characteristics, T_J = 150 °C

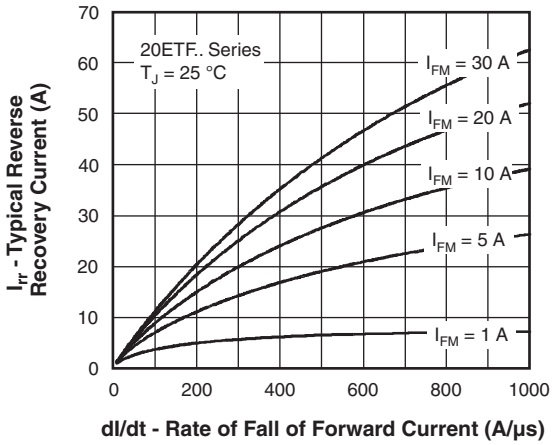


Fig. 12 - Recovery Current Characteristics, T_J = 25 °C

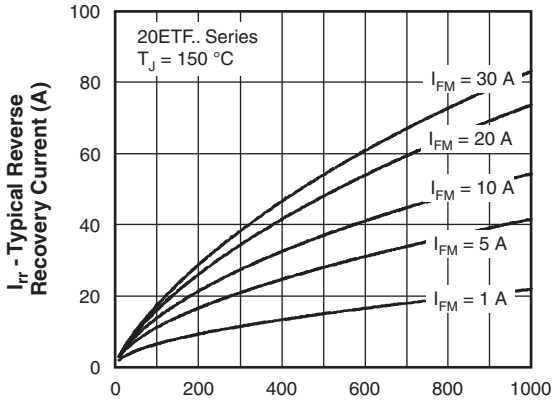


Fig. 13 - Recovery Current Characteristics, T_J = 150 °C

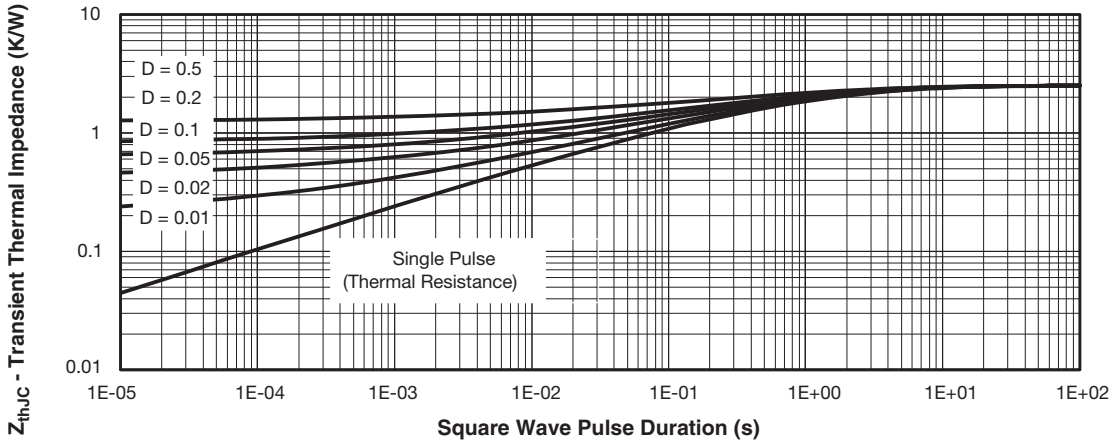


Fig. 14 - Thermal Impedance Z_{thJC} Characteristics

ORDERING INFORMATION TABLE

Device code

VS-	20	E	T	F	06	FP	PbF
1	2	3	4	5	6	7	8

1 - Vishay Semiconductors product

2 - Current rating (20 = 20 A)

3 - Circuit configuration:
E = Single diode

4 - Package:
T = TO-220

5 - Type of silicon:
F = Fast soft recovery rectifier

6 - Voltage code x 100 = V_{RRM}
02 = 200 V
04 = 400 V
06 = 600 V

7 - FULL-PAK

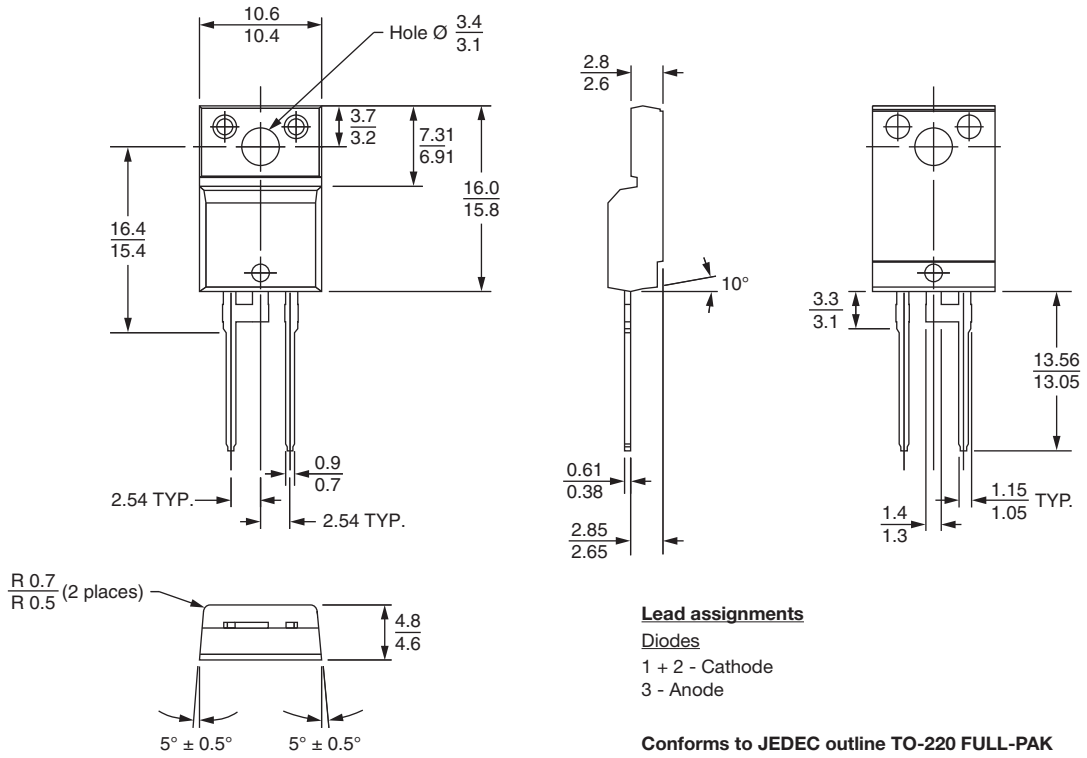
8 - Environmental digit:
- PbF = Lead (Pb)-free and RoHS compliant
- -M3 = Halogen-free, RoHS compliant and terminations lead (Pb)-free

ORDERING INFORMATION (Example)

PREFERRED P/N	QUANTITY PER T/R	MINIMUM ORDER QUANTITY	PACKAGING DESCRIPTION
VS-20ETF02FPPbF	50	1000	Antistatic plastic tubes
VS-20ETF02FP-M3	50	1000	Antistatic plastic tubes
VS-20ETF04FPPbF	50	1000	Antistatic plastic tubes
VS-20ETF04FP-M3	50	1000	Antistatic plastic tubes
VS-20ETF06FPPbF	50	1000	Antistatic plastic tubes
VS-20ETF06FP-M3	50	1000	Antistatic plastic tubes

LINKS TO RELATED DOCUMENTS		
Dimensions		www.vishay.com/doc?95005
Part marking information	TO-220 FP PbF	www.vishay.com/doc?95009
	TO-220 FP -M3	www.vishay.com/doc?95440
SPICE model		www.vishay.com/doc?95410

DIMENSIONS in millimeters



Lead assignments

Diodes

1 + 2 - Cathode

3 - Anode

Conforms to JEDEC outline TO-220 FULL-PAK

Disclaimer

ALL PRODUCT, PRODUCT SPECIFICATIONS AND DATA ARE SUBJECT TO CHANGE WITHOUT NOTICE TO IMPROVE RELIABILITY, FUNCTION OR DESIGN OR OTHERWISE.

Vishay Intertechnology, Inc., its affiliates, agents, and employees, and all persons acting on its or their behalf (collectively, “Vishay”), disclaim any and all liability for any errors, inaccuracies or incompleteness contained in any datasheet or in any other disclosure relating to any product.

Vishay makes no warranty, representation or guarantee regarding the suitability of the products for any particular purpose or the continuing production of any product. To the maximum extent permitted by applicable law, Vishay disclaims (i) any and all liability arising out of the application or use of any product, (ii) any and all liability, including without limitation special, consequential or incidental damages, and (iii) any and all implied warranties, including warranties of fitness for particular purpose, non-infringement and merchantability.

Statements regarding the suitability of products for certain types of applications are based on Vishay’s knowledge of typical requirements that are often placed on Vishay products in generic applications. Such statements are not binding statements about the suitability of products for a particular application. It is the customer’s responsibility to validate that a particular product with the properties described in the product specification is suitable for use in a particular application. Parameters provided in datasheets and/or specifications may vary in different applications and performance may vary over time. All operating parameters, including typical parameters, must be validated for each customer application by the customer’s technical experts. Product specifications do not expand or otherwise modify Vishay’s terms and conditions of purchase, including but not limited to the warranty expressed therein.

Except as expressly indicated in writing, Vishay products are not designed for use in medical, life-saving, or life-sustaining applications or for any other application in which the failure of the Vishay product could result in personal injury or death. Customers using or selling Vishay products not expressly indicated for use in such applications do so at their own risk. Please contact authorized Vishay personnel to obtain written terms and conditions regarding products designed for such applications.

No license, express or implied, by estoppel or otherwise, to any intellectual property rights is granted by this document or by any conduct of Vishay. Product names and markings noted herein may be trademarks of their respective owners.

Material Category Policy

Vishay Intertechnology, Inc. hereby certifies that all its products that are identified as RoHS-Compliant fulfill the definitions and restrictions defined under Directive 2011/65/EU of The European Parliament and of the Council of June 8, 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment (EEE) - recast, unless otherwise specified as non-compliant.

Please note that some Vishay documentation may still make reference to RoHS Directive 2002/95/EC. We confirm that all the products identified as being compliant to Directive 2002/95/EC conform to Directive 2011/65/EU.

Vishay Intertechnology, Inc. hereby certifies that all its products that are identified as Halogen-Free follow Halogen-Free requirements as per JEDEC JS709A standards. Please note that some Vishay documentation may still make reference to the IEC 61249-2-21 definition. We confirm that all the products identified as being compliant to IEC 61249-2-21 conform to JEDEC JS709A standards.